

Abstract of the Disclosure

A rapid thermal process (RTP) provides steps wherein silicon wafers that are pre-coated with barrier metal films by either in-situ or ex-situ CVD or physical vapor deposition (PVD) are pre-treated, prior to deposition of a Cu film thereon, in a temperature range of between 250 and 550 degrees Celsius in a non-reactive gas such as hydrogen gas (H_2), argon (Ar), or helium (He), or in an ambient vacuum. The chamber pressure typically is between 0.1 mTorr and 20 Torr, and the RTP time typically is between 30 to 100 seconds. Performing this rapid thermal process before deposition of the Cu film results in a thin, shiny, densely nucleated, and adhesive Cu film deposited on a variety of barrier metal surfaces. The pre-treatment process eliminates variations in the deposited Cu film caused by Cu precursors and is insensitive to variation in precursor composition, volatility, and other precursor variables. Accordingly, the process disclosed herein is an enabling technology for the use of metal organic CVD (MOCVD) Cu in IC fabrication.